

Methods

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Introduction

As part of a research team this summer, 2007, we will be collecting data points for avian and mammalian species in several Costa Rican national parks. Our group will consist of 23 students and several faculty advisors, as part of a group from Huxley College, Western Washington University. GPS units will be the major mode of data collection, and we will therefore spend time instructing proper use and techniques for recording data to our peers.

Study Area

There are two primary study areas within the country of Costa Rica that this project is concerned with. The first is Corcovado National Park. This park is located on the Osa Peninsula in southwest Costa Rica. The area of the park is 41,788 hectares. The other study area is Carara National Park, located on the Gulf of Nicoya about 88 kilometers west of San Jose. This park is approximately 4,700 hectares. Because of the relative small geographical areas of these national parks, a high resolution DEM would be optimal for this project. Both parks are densely covered in canopy cover. Corcovado is last region along the western coast of Central America that still has old growth forest. Logging, even in Carara, has taken a large toll on much of the coastal environment. These parks are home to a immensely diverse array of fauna and flora. There are a total of 480 avian species, 200 mammal species, and over 9,000 flora species. Costa Rica ranges in elevation from sea level to a peak of 3,810m at Cerro Chirripo. This dramatic elevation difference is one reason for the capability of such a diverse ecology to grow. These two parks were specifically chosen as research locations for several reasons. One, the trip leader, Dr. Troy Abel has already conducted research in Carara National Park. Two, Brett Sylvester, a grad Western Washington University grad student has already done research in Corcovado National Park. Through the social connections made by these two individuals during their trips, a gate was opened, allowing for our own group to participate in such a unique immersion.

Data Description

We have a couple of raster layers which we are using for our project. We have a 90 meter digital elevation model of the entire country of Costa Rica. We have used this to generate base maps for the country, however we would like to find a DEM with better resolution. We have a 30 meter hillshade layer which we obtained from the Mesostor website. This was obviously generated from a 30 meter DEM, however we have not yet been able to find this. For the time being we are using the hillshade layer for our base maps.

We also have several vector layers we will use for our project. This includes a layer of 81 Costa Rican cities, and expansive layers of roads and rivers. We also have data for

drainage, precipitation, and temperature as well as administrative boundaries within the country.

Pre-processing Information

The main process of this project up to this point has been data acquisition. Attempting to acquire a significant amount of GIS data pertaining to a foreign country has been a bit of a challenge at times. To begin this search, we checked several internet sites advertising international GIS data. Several of these sites offered Costa Rica data, but wanted money in return. The two primary sites which we were able to obtain useful Costa Rica GIS data free of charge were Geocommunity and Mesostor. We were also able to obtain data through contacts of Dr. Troy Able of Western Washington University. We are not yet satisfied with the amount of data we have acquired and are still looking for more to improve our project.

The data we obtained was projected in several different coordinate systems. We obtained a high quality 30 kilometer hillshade layer through the Mesostor website which was projected in a coordinate system called WGS_1984_Transverse_Mercator. Costa Rica is split between UTM zones sixteen and seventeen. The boundary runs right down the middle of the country. To accommodate for this, the central meridian of the hillshade layer had been moved over to -84 degrees. We reprojected all of our other data to this coordinate system using the project tool. Once this step was complete, we transferred all of our data into a Geodatabase.

Because of the lack of data, this project also requires us to create some of our own features using digitization. We are mapping Carara and Corcovado National Parks, however we have not found a Costa Rican National Parks layer. To accommodate for this, we obtained existing maps of these national parks and created borders for the parks using Adobe Photoshop. This was done through visual analysis. We used our roads and rivers layers as reference points to match the boundaries as best we could.

Procedures

In order to convert the data we collected into something cartographically manageable, several steps were taken. Starting with the 90m DEM, a mask was first created using the Administration layer to block out the ocean included in the DEM. Then with a DEM of only the land, another mask was used cut land off that was not Costa Rica. The Administration layer was also used for this, since it only included land within the Costa Rican border. Now, the 90m DEM only covers Costa Rica and this was used for the main Costa Rican map. Next, using the drainage basin layer, drainages were selected containing either Carara or Corcovado National Parks and new layers created from them. A mask was then created for each park region by masking the 90m DEM to the new drainage layers. There is now a DEM for just each area of interest.

For GPS data collection, a tutorial was created for instruction. This tutorial includes a background section explaining the relationship between a receiving GPS unit and the

array of satellites orbiting Earth, sending the signals received by each unit. Next, a list of unit functions for the GPSmap 60 and a diagram were included. Finally, instructions for creating waypoints and tracks were created.

Digitizing was performed to create park boundaries for Carara and Corcovado National Parks. To do this, a map of each park was downloaded as a .jpg and imported into the ArcMap layout for each park. Then, the park was traced using the draw polygon tool. These polygons were given a 10% hatch and colored green to represent each park and placed over its corresponding location on the DEM. Trails were also drawn in using the draw line tool. These were traced in over the trails present on the maps, colored red and changed to dashed lines rather than solid.

A Microsoft Access database will be produced to represent the data layers collected. These include the layer files collected before the field research and the GPS points and tracks created while in the field. In Access, each GPS point will be used as an ID from which data collected at each site will be added. This will include the types of avian and mammalian species heard or seen at each site, as well as its location, type of environment, date, elevation and other relevant information collected.

Data layers included in the Cartography include rivers, roads, the 90m DEM and two corresponding hillshades, the national border, and the park borders. Cities are labeled, as well as major rivers in the parks. A select by attribute process was completed for both the roads and rivers layers. For the roads, a selection was made for roads with a length greater than 8,000m. Rivers had a selection made for those greater than 5,000m. These were then saved as new layer files and used on the map instead of the original layers.

